

NO ~~Insert~~

In The Drawings

Please replace informal drawings (FIGURES 1-14) with the proposed amended formal drawings (FIGURES 1-14).

In The Specification

At ~~page 1, line 3~~ before "Background of Invention" insert the following substitute paragraphs:

RELATED APPLICATION

The present application is a continuation of co-pending U.S. Patent Application Serial No. 09/351,418, titled MODIFICATION OF THE SHAPE/SURFACE FINISH OF BATTERY GRID WIRES TO IMPROVE PAST ADHESION, filed July 9, 1999, which is hereby incorporated by reference.

In The Claims

Please cancel Claims ~~1-38~~, without prejudice.

Please add the following new Claims 39-114 as follows:

- 1 ~~39.~~ A method of making a battery comprising:
- 2 forming a strip of interconnected grids from a grid material, each
- 3 interconnected grid including a network bordered by at least one frame element,
- 4 one of the frame elements having a current collector, the network comprising a
- 5 plurality of spaced apart grid elements, each grid element having opposed ends,
- 6 each opposed end being joined to one of a plurality of nodes to define a plurality
- 7 of open spaces in the network;
- 8 forming at least a portion of the grid elements at a position intermediate
- 9 the opposed ends of the grid element such that a first transverse cross-section
- 10 taken intermediate the opposed ends of the grid element differs from a second
- 11 transverse cross-section taken at one of the opposed ends of the grid element;
- 12 applying paste to the strip; and
- 13 cutting the strip to form a plurality of plates.

1 40. The method of Claim 39 wherein forming at least a portion of the grid
2 elements comprises:
3 applying a torsional stress to the grid element at the position intermediate
4 the opposed ends of the grid element thereby rotating the grid element.

1 41. The method of Claim 39 wherein forming at least a portion of the grid
2 elements comprises:
3 applying a torsional stress to the grid wire element at the position
4 intermediate the opposed ends of the grid element thereby rotating the grid
5 element.

1 42. The method of Claim 39 wherein forming at least a portion of the grid
2 elements comprises:
3 stamping the grid element at the position intermediate the opposed ends
4 of the grid element.

1 43. The method of Claim 42 wherein the first transverse cross-section
2 substantially has a shape selected from the group comprising diamond, oval, rhomboid,
3 hexagon, and octagon.

1 44. The method of Claim 43 wherein the network and each of the frames
2 define opposed substantially planar surfaces, and each first transverse cross-section does
3 not extend beyond the planar surfaces.

1 45. The method of Claim 39 wherein the network and each of the frames
2 define opposed substantially planar surfaces, and each second transverse cross-section
3 does not extend beyond the planar surfaces.

1 46. The method of Claim 41 wherein forming the strip of interconnected
2 grids from a grid material comprises:
3 feeding a continuous strip of the grid material along a linear path aligned
4 with the longitudinal direction of the strip; and
5 punching grid material out of the strip to form the strip of interconnected
6 grids.

1 47. The method of Claim 46 wherein the continuous strip of the grid material
2 is formed by a continuous casting process.

1 48. The method of Claim 46 wherein the continuous strip of the grid material
2 is formed by a rolling process.

1 49. The method of Claim 41 wherein forming the strip of interconnected
2 grids from a grid material comprises:
3 feeding a continuous strip of the grid material along a linear path aligned
4 with the longitudinal direction of the strip;
5 piercing apertures in the strip of grid material; and
6 laterally expanding the strip of grid material to form the strip of
7 interconnected grids.

1 50. The method of Claim 41 wherein forming the strip of interconnected
2 grids from a grid material comprises:
3 melting the grid material;
4 continuously casting the grid material to form a continuous web; and
5 rolling the web to form the strip of interconnected grids.

1 51. The method of Claim 41 wherein forming the strip of interconnected
2 grids from a grid material comprises:
3 melting the grid material; and
4 continuously casting the grid material to form the strip of interconnected
5 grids.

1 52. The method of Claim 41 further comprising forming at least a portion of
2 the nodes before applying paste to the strip.

1 53. The method of Claim 39 wherein the grid element is a grid wire.

1 54. The method of Claim 39 wherein the network is a web.

1 55. The method of Claim 39 wherein forming the grid comprises deforming
2 the grid.

1 56. The method of Claim 39 further comprising installing at least one plate in
2 a container.

1 57. The method of Claim 39 further comprising providing acid in the battery.

1 58. The method of Claim 39 wherein the collector comprises a lug.

1 ~~59.~~ A method of making a battery of a type having plurality of grids
2 comprising:

3 forming a strip of interconnected grids from a grid material, each
4 interconnected grid including a network bordered by at least one frame element,
5 one of the frame elements having a current collector, the network comprising a
6 plurality of spaced apart grid elements, each grid element having opposed ends,
7 each opposed end being joined to one of a plurality of nodes to define a plurality
8 of open spaces in the network;

9 forming at least a portion of the grid elements at a position intermediate
10 the opposed ends of the grid element such that a first transverse cross-section
11 taken intermediate the opposed ends of the grid element differs from a second
12 transverse cross-section taken at one of the opposed ends of the grid element;
13 and

14 cutting the strip to form a plurality of grids.

1 ~~69.~~ A method of making a battery of a type having a plurality of battery
2 plates comprising:
3 melting a grid material;
4 continuously casting the grid material to form a continuous strip;
5 rolling the strip;
6 punching grid material out of the strip to form interconnected grids, each
7 interconnected grid including a network bordered by a frame, the frame having a
8 current collector lug, the network comprising a plurality of spaced apart grid
9 elements, each grid element having opposed ends, each opposed end being
10 joined to one of a plurality of nodes to define a plurality of open spaces in the
11 network;
12 stamping at least a portion of the grid elements at a position intermediate
13 the opposed ends of the grid element such that a first transverse cross-section
14 taken at the position intermediate the opposed ends of the grid element differs
15 from a second transverse cross-section taken at one of the opposed ends of the
16 grid element;
17 applying paste to the strip; and
18 cutting the strip to form the plurality of battery plates.

1 70. The method of Claim 69 wherein the first transverse cross-section
2 substantially has a shape selected from group comprising diamond, oval, rhomboid,
3 hexagon, and octagon.

1 71. The method of Claim 69 wherein the network and each of the frames
2 define opposed substantially planar surfaces, and each first transverse cross-section does
3 not extend beyond the planar surfaces.

1 72. The method of Claim 69 wherein the grid element is a grid wire.

1 73. The method of Claim 69 wherein the network is a web.

1 74. The method of Claim 69 further comprising the step of installing at least
2 one plate in a container.

1 75. The method of Claim 69 further comprising the step of providing acid in
2 the battery.

1 76. The method of Claim 69 wherein forming the grid comprises deforming
2 the grid.

1 77. The method of Claim 69 wherein the collector comprises a lug.

1 78. A method of forming a battery of a type having a positive plate
2 comprising:

3 casting a material to form a continuous strip;

4 rolling the strip;

5 punching material out of the strip to form interconnected grids, each
6 interconnected grid including a network and a current collector, the network
7 comprising a plurality of spaced apart grid elements, each grid element having
8 opposed ends, each opposed end being joined to one of a plurality of nodes to
9 define a plurality of open spaces in the network;

10 stamping at least a portion of the grid elements at a position intermediate
11 the opposed ends of the grid element such that a first transverse cross-section
12 taken at the position intermediate the opposed ends of the grid element differs
13 from a second transverse cross-section taken at one of the opposed ends of the
14 grid element;

15 applying paste to the strip; and

16 cutting the strip to form a plurality of positive plates.

1 79. The method of Claim 78 wherein the first transverse cross-section
2 substantially has a shape selected from group comprising diamond, oval, rhomboid,
3 hexagon, and octagon.

1 80. The method of Claim 79 wherein the network and each of the frames
2 define opposed substantially planar surfaces, and each first transverse cross-section does
3 not extend beyond the planar surfaces.

1 81. The method of Claim 78 wherein the grid element is a grid wire.

1 82. The method of Claim 78 wherein the network is a web.

1 83. The method of Claim 78 further comprising the step of installing at least
2 one plate in a container.

1 84. The method of Claim 78 further comprising the step of providing acid in
2 the battery.

1 85. The method of Claim 78 wherein forming the grid comprises deforming
2 the grid.

1 86. The method of Claim 78 wherein the collector comprises a lug.

1 ~~87.~~ A method of making grid for use in a battery comprising:
2 forming a preform grid, the preform grid including a network bordered
3 by at least one frame element, one of the frame elements having a current
4 collector, the network comprising a plurality of spaced apart grid elements, each
5 grid element having opposed ends, each opposed end being joined to one of a
6 plurality of nodes to define a plurality of open spaces in the network; and
7 forming at least a portion of the grid elements of the preform grid at a
8 position intermediate the opposed ends of the grid element such that a first
9 transverse cross-section taken at the position intermediate the opposed ends of
10 the grid element differs from a second transverse cross-section taken at one of
11 the opposed ends of the grid element.

1 97. The grid of Claim 96 wherein the second transverse cross-section is
2 substantially rectangular.

1 98. The grid of Claim 96 wherein the first transverse cross-section is a
2 substantially rectangular cross-section rotated about 20 degrees to about 70 degrees in
3 relation to the second transverse cross-section.

1 99. The grid of Claim 96 wherein the first transverse cross-section is a
2 substantially rectangular cross-section rotated about 35 degrees to about 55 degrees in
3 relation to the second transverse cross-section.

1 100. The grid of Claim 96 wherein the first transverse cross-section
2 substantially has a shape selected from group consisting generally of diamond, oval,
3 rhomboid, hexagon, and octagon.

1 101. The grid of Claim 96 wherein the network provides a frame and each of
2 the frames define opposed substantially planar surfaces, such that each first transverse
3 cross-section does not extend beyond the planar surfaces.

1 102. The grid of Claim 101 wherein the first transverse cross-section is
2 substantially a diamond shape.

1 103. The grid of Claim 101 wherein the first transverse cross-section is
2 substantially a hexagon shape.

1 104. The grid of Claim 101 wherein the first transverse cross-section is
2 substantially an octagon shape.

1 105. The grid of Claim 101 wherein the first transverse cross-section is
2 substantially an oval shape.

1 106. The grid of Claim 101 wherein the first transverse cross-section is
2 substantially a rhomboid shape.

1 107. The grid of Claim 96 wherein the grid element is a grid wire.

1 108. The grid of Claim 96 wherein the network is a web.

1 109. The grid of Claim 96 further comprising a container.

1 110. The grid of Claim 96 wherein the collector comprises a lug.

1 ~~111.~~ A battery comprising:

2 a frame;

3 at least one grid comprising a first frame member spaced apart from a
4 second frame member;

5 wherein the first frame member has a first transverse cross-section and
6 the second frame member has a second transverse cross-section area.

1 112. The battery of Claim 111 wherein the frame defines a plane and the first
2 and second transverse cross-section areas do not substantially intersect the plane.

1 113. The battery of Claim 112 further comprising a paste coupled to the grid.

1 114. The battery of Claim 113 further comprising a container.